GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER – III • EXAMINATION – WINTER 2012

Sı Sı Ti Ir	ubjec ubjec ime: 1 nstru 1 2 3	t code: 731002 Date: 26/12/2012 t Name: Advanced Cryo Coolers 10.30 am – 01.00 pm Total Marks: 70 ctions: . Attempt all questions. . Make suitable assumptions wherever necessary. . Figures to the right indicate full marks.	
Q.1	(a)	Describe the difference between recuperative and regenerative cryocooler with suitable	07
	(b)	Describe the methodology of loss analysis of basic pulse tube cryocooler.	07
Q.2	(a)	Describe the working of Ideal Stirling Cycle with necessary diagrams. Also draw the	07
	(b)	Explain about Phase Shift Mechanisms and DC flow applicable to a typical pulse tube refrigerator.	07
		OR	
	(b)	Explain pressure-volume variations phenomenon for the Stirling Cryocooler.	07
Q.3	(a)	Explain briefly on working of (a) Sorption compressor, (b) Electrochemical compressor used for cryocoolers	07
	(b)	Describe the advantages and disadvantages of J-T cryocoolers applied for cooling of infrared sensors.	07
		OR	
Q.3	(a) (b)	Write short note on Mass flow rate and cooling capacity of the J–T cryocooler. Describe selection procedure of gas mixture components for MR J-T cryocooler.	07 07
Q.4	(a) (b)	Explain about monolithic regenerator and multilayered regenerators with necessary figures. Describe about valve timing and its effect on performance of 4 K pulse tube refrigerator.	07 07
		OR	
Q.4	(a)	Explain with neat sketch the construction of He ³ -He ⁴ dilution refrigerator precooled by G- M two stage Cryspecter to achieve temperature of 0.015 K	07
	(b)	Explain significance of miniaturization of pulse tube cryocooler in space applications.	07
Q.5	(a) (b)	Give classification of different regenerative materials with respect to temperature range. Describe concept of microgravity applicable to dilution refrigerator. What are the merits of it?	07 07

OR

Q.5	(a)	Write on applications of cryocoolers for military and medical along with suitable examples.	07
	(b)	Write short note on followings.	07
		(i). Cryocooler reliability (ii) Linear compressor cryocooler	
